EVALUATION OF DUCWEED`S INFLUENCE ON WATER QUALITY OF BRULLUS LAKE, EGYPT, USING REMOTE SENSING TECHNIQUES AND GEOGRAPHIC INFORMATION SYSTEMS

Submitted By

Mona Fathy Mohamed Ahmed Allam

B.Sc. of Science, (Chemistry), Faculty of Science, Helwan University, 2000
Master of Environmental Science, Institute of Environmental Studies and Research, Ain Shams University, 2009

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Doctor of Philosophy Degree
In
Environmental Sciences

Department of Environmental Basic Sciences
Institute of Environmental Studies and Research
Ain Shams University

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APPROVAL SHEET

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This Thesis Towards a Doctor of Philosophy Degree in Environmental Sciences Has been Approved by:

Name Signature

1-Pof. Dr. Mohamed Gharib El Malky
Prof. of Environmental Geophysics, Department of Environmental Basic Sciences - Institute of Environemntal Studies & Research
Ain Shams University

2-Prof. Dr. Mohamed Ezz El-Din Al-Rai
Emeritus Prof. and Former Dean of Institute of Post Graduate
Alexandria University

3-Pof. Dr. Mohammed Adel Yehia
Emeritus Prof. of Geology
Faculty of Science
Ain Shams University

4-Prof. Dr. Mostafa Mohamed Hassan Khalil
Prof. of Inorganic and Analytical Chemistry
Faculty of Science
Ain Shams University

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Under The Supervision of:

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Emeritus Prof. of Geology
Faculty of Science
Ain Shams University

2-Prof. Dr. Mostafa Mohamed Hassan Khalil
Prof. of Inorganic and Analytical Chemistry
Faculty of Science
Ain Shams University

3-Dr. Ahmed Ahmed Khalafallah
Lecturer of Plant Ecology
Faculty of Women
Ain Shams University

4-Dr. Sameh Bakr El Sayed El Kafrawy
Researcher, Marine Sciences Department
The National Authority for Remote Sensing and Space Science, NARSS

5-Dr. Eng. Mohie El Deen Mohammed Omar
Researcher, Nile Research Institute – National Water Research Center
Ministry of Water Resources and Irrigation

Giving

To the sprite of my mother

To my Father

For anyone benefits of this thesis

Please Pray for my Mother

God Bless My Mother

Acknowledgment

In the name of Allah the merciful the beneficent

In the beginning, I am very indebted to My Dead Mother for her continuous supporting to me in the past, present and future, god bless you my mother

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ABSTRACT

Lakes are important sources of fresh water and fish production all over the world. Egyptian lakes have severe problems and some of them have special nature. These lakes have an ecosystem of distinctive nature and are facing many challenges. Lake Burullus is one of the vulnerable Egyptian coastal lakes. The lake receives waste water from 7 drains (7, 8, 9, 11, Burullus east and west and El Gharbia). It is subjected to tremendous pressures causing rapid environmental degradation and dramatic threats to its ecosystems.

Water quality monitoring in water bodies incorporating the use of earth observation products has become a major component in many a water quality monitoring program. This is majorly due to the inadequacies of traditional methods imposed by the lack of comprehensive and reliable in-situ datasets.

Aquatic plants have been considered a promising approach to remove different elements from water not only for its low cost comparing to the conventional wastewater treatment but also for its environmental issues.

The present study aimed to evaluate the water quality of Burullus Lake and drains, assess the RS and GIS techniques applicability to map water quality of the selected parameters of Burullus Lake, investigate the potential of duckweed for treating drain 9 wastewater as a way of enhancing water quality of Burullus Lake and to apply Qual2k model to investigate the potential of constructed wetlands covered by duckweeds and connected to the branches of drain No. 9, on the concentrations of the selected water quality parameters at the outflow of the drain No. 9.

Spatial distribution of pH, HCO_3, CO_3 *Chl-a*, turbidity, NH4, N-NH_4, N-NO3, TDS, Phosphate, Heavy metals (Pb, Cu, Zn), Cations (Na, Mg, K, Ca) and Anions (Cl, SO_4) were the parameters of interest.

Digital maps showed that the southern section of the lake more polluted than the other sections and that due to the drainage wastewater which received.

The results of biological treatment appeared that *L. gibba* plants have high efficiency in removing nutrients; TP, TN, NH_4 and NO_3 by 65, 73.55, 75.51 and 90.0 respectively. The plant also showed high potential for Chl_a removal by 87.25%. In addition, the plant have effectively removed the heavy metals Pb and Cu by 100% but removed Zn by 95%.

The results showed also that QUAL2K proved to be an effective tool in the comparative evaluation of potential water quality improvement programs, particularly on water quality parameters of drain 9 and its

tributaries. For all considered scenarios, most selected water quality parameters of drain9 were improved significantly and complied with the standards of Egyptian law 48/1982 .So the study recommended that construct wetland at the start of the drain to enhance the ecology of lake. The study also recommended that remote sensing coupled with GIS could afford an integrated scheme for mapping water quality.

Keywords: Burullus Lake – Water quality – Remote sensing - Biological treatment – QUAL2K

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